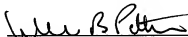


0782/HAMS/0003/WBP the fee of \$130.00 and any additional fees required to make this Petition acceptable to the US Patent and Trademark Office.

Applicants respectfully submit this Petition and requests acceptance of same.

Respectfully submitted,



William B. Patterson
Registration No. 34,102
PATTERSON & SHERIDAN, L.L.P.
3040 Post Oak Blvd. Suite 1500
Houston, TX 77056
Telephone: (713) 623-4844
Facsimile: (713) 623-4846
Attorney for Applicants

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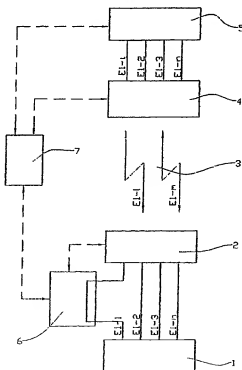
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- (71) Applicant (for all designated States except US):
MARITIME COMMUNICATIONS PARTNER AS
[NO/NO]; Televeien 3, N-4879 Grimsd (NO).
- (72) Inventors; and
(75) Inventors/Applicants (for US only): **HAGLUND**,
- Svein [NO/NO]; Fredensvei 4, N-4836 Arendal (NO);
GUSTAVSEN, Trygve, Sten [NO/NO]; Skibberhei 9,
N-4817 His (NO); KJELLSTADLI, Kjell [NO/NO];
Skibberheimet 4, N-4817 His (NO); LIEN, Sjur, Thomas
[NO/NO]; Bråstad, N-4848 Arendal (NO); HØGSAAS,
Trond [NO/NO]; Børge Trollesvei 9, N-4823 Nedenes
(NO); REBSTIE, Knut, Einar [NO/NO]; Semsveien
18, N-4870 Fevik (NO); FJELLHEIM, Knut [NO/NO];
Åsveien 21, N-4817 His (NO)
- (74) Agent: HÅMSØ PATENTBYRÅ ANS; PO Box 171,
N-4302 Sandnes (NO)
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(54) Title: METHOD FOR REDUCING THE TIME DELAY IN A TELEPHONE SYSTEM





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For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette

METHOD FOR REDUCING THE TIME DELAY IN A TELEPHONE SYSTEM

This invention regards a method for reducing the time delay in a telephone system. More particularly, it regards a method for reducing the audible time delay that occurs when the signals are transmitted e.g. via a satellite channel. In the following, reference is made, for illustrative purposes, to a satellite connection or channel. Satellite connection is here taken to mean an entire satellite system comprising multiplexers (MUX), antennas and satellite.

- 10 In the following, reference is made, for illustrative purposes, to a GSM system (GSM - Global System for Mobile Communication) which employs a so-called A-interface between a Base Station System (BSS) and a Mobile Service Switching Centre (MSC). In conventional mobile telephony all calls are
15 connected in the Mobile Service Switching Centre.

Under normal circumstances such a solution is acceptable, but when the BSS and the MSC communicates e.g. via a satellite connection, an audible time delay in the order of 0.5 seconds will arise.

Typically, this is a problem when the BSS is located on a ship and the MSC is on shore.

The time delay doubles when both parties are on the same side of the satellite connection, as the signals must then first
5 be sent via the satellite connection to the MSC and then return to the BSS via the same satellite connection.

The object of the invention is to remedy the disadvantages of prior art.

The object is achieved in accordance with the invention, by
10 the characteristics stated in the description below and in the following claims.

According to a standardized protocol for telephone systems of this type, signalling and speech are separated into two separate channels, a signalling channel and a speech channel.
15 Thus it is possible to process data transmitted via the speech channel without interfering with the signalling channel.

When two persons on the same side of a satellite connection call each other, the speech channels can be connected by use
20 of a local change-over switch or switcher, while the signalling channel is transmitted to the MSC via the satellite connection. Thus the speech channel is not transmitted via the satellite connection and therefore is not subject to said time delay.

25 Monitoring and analysis of the data stream in the signalling channel between the BSS and the MSC makes it possible to extract any data indicating that a call should be switched locally, whereupon the respective speech channels are connected locally.

A further advantageous feature of the invention is that the transmission capability requirement of the satellite connection is reduced.

5 An A-interface (interface) for communication between a BSS and a MSC comprises a number of TDM (time-division multiplex) connections. By concentrating the number of calls routed via the satellite connection to a smaller number of TDM links at the BSS in order then to expand these concentrated TDM links to the initial number at the MSC, it becomes possible to save
10 transmission capability in the satellite connection. Thus, TDM time slots not transmitted to the MSC can be used for local calls.

In a conventional mobile telecommunication system the capacity is determined by the total number of TDM time slots and
15 links between the BSS and the MSC.

In those cases where all TDM time slots in said concentrated transmission connection are being used, the conventional mobile telecommunication system will attempt to set up more calls if there are any free TDM time slots for local calls.
20 The reason for this is that a conventional MSC will not be able to keep track of which calls are local and which are long distance calls, and in consequence, nor will it know the capacity situation in the transmission connection.

The invention comprises a method of preventing the MSC from
25 attempting to set up further calls when the capacity of the transmission connection is fully utilised.

The following describes a non-limiting example of a preferred method illustrated in the accompanying drawings, in which:

Figure 1 shows the principal components of a telephone system according to the invention;

Figure 2 shows the transmission paths of the signalling and speech channels according to prior art; and

- 5 Figure 3 shows the transmission paths of the signalling and speech channels according to the invention, the transmission path of the signalling channel being illustrated by a broken line.

10 In the drawings, reference number 1 denotes a BSS of a type that is known *per se*. The BSS 1 communicates with a local change-over switch or switcher 2 via a plurality of channels E1-1 to E1-n, where n is a selected number.

The local switcher 2 communicates via a transmission system 3, here in the form of satellite communication, with a remote
15 switcher 4 via a plurality of channels E1-1 to E1-m, where 1 and m are selected numbers.

The remote switcher 4 communicates via a plurality of channels E1-1 to E1-n with an MSC 5 of a type that is known *per se*. The channels E1-1- to E1-n between the remote switcher 4
20 and the MSC 5 correspond to the channels E1-1 to E1-n between the BSS 1 and the local switcher 2.

A TDM time slot monitor, decoder and analyser 6, hereinafter denoted TDM analyzer or optionally analyzer, is connected to the channels between the BSS 1 and the local switcher 2. In
25 Figure 1 this is illustrated by channel E1-1 being connected to the TDM analyzer 6.

The TDM analyzer 6 communicates with the local switcher 2 and with the remote switcher 4 and the MSC 5 by means of a TCP/IP

(Transmission Control Protocol/Internet Protocol) connection/network 7.

The TDM analyzer 6 constructs a local database of so-called IMSI (International Mobile Subscriber Identity) and MD-ISDN (Mobile Station - Integrated Services Digital Network) number for each mobile telephone associated with the BSS 1.

The IMSI number is read from the signalling message 'location Updating Accept', while MS-ISDN is obtained from the MSC 5 by making an inquiry using the IMSI number as a reference.

10 Then the TDM analyzer 6 establishes a temporary list of all subscribers attempting to set up calls, hereinafter denoted A-subscribers 8, in the MSC 5.

The following A-interface messages are monitored in order to obtain the required information, the nature of the information being indicated in brackets:

4. Cm_service_request (A-IMSI)
5. Connection_confirmed (logical signalling link ID)
6. Setup (MS-ISDN for B-subscriber)
7. Assignment_request (information regarding which time slot is being used).

The messages are obtained from the protocols SCCP (Signalling Connection Control Part), DTAP (Direct Transfer Application Part), BSSMAP (Base Station System Management Application Part) in the A-interface.

A temporary listing is stored in the MSC 5, which includes all mobile users to whom a dial-up is attempted, at all times, and these users/subscribers are hereinafter denoted B-subscribers 9.

- 5 The following A-interface messages are monitored in order to obtain the required information, the nature of the information being indicated in brackets:

8. Paging_response (B-IMSI)

9. Connection_confirmed (logical signalling link Id)

- 10 10. Assignment_request (information regarding which time slot is being used).

11. Connect_acknowledge (used as time of concentration for external calls).

- When the A-subscriber receives the A-interface message 'connect_ack' the TDM analyzer 6 will make an inquiry for the B-MS-ISDN number in the above mentioned subscriber database and then check whether the resulting B-IMSI number is on the list of B-subscribers to whom a dial-up is being attempted. If the number is there, the corresponding TDM time slots are cross-
20 connected in the local switcher 2.

If calls are not to be cross-connected locally, e.g. when the A- and B-subscribers 8, 9 are in different BSS's 1, collected TDM time link information is used to initiate the desired concentration of the TDM time links.

- 25 All connections of calls and concentrations of TDM time links are controlled by the TDM analyzer 6. TDM time slot informa-

tion for the call in question is used to initiate switching of TDM time slots between the TDM time links on the BSS 1 and MSC 5 side of the local switcher 2 or the remote switcher 4 respectively, and the TDM links transmitted via the satellite
5 connection 3.

Figure 1 shows an example in which four TDM-links are concentrated down to two TDM-links. Obviously other constellations are possible.

The TDM analyzer 6 stores and maintains a list of all calls switched through the local switcher 2 and the remote switcher
10 4 at all times. When a call is terminated, i.e. the A-interface message 'released' is read from the signalling channel for an active call, the TDM analyzer 6 will notify the local switcher 2 and the remote switcher 4 to break the
15 connections for the call in question.

The relaying of information between the TDM analyzer 6 and the local switcher 2 takes place via a normal TCP/IP network. Likewise, the remote switcher 4 receives information from the TDM analyzer 6 in order to extract the TDM links from the
20 satellite connection 3 to the total number of TDM links in the system in the correct manner.

The TDM analyzer 6 is arranged so as to keep track of the status of the capacity of the satellite connection 3 and prevent further calls from being set up in the MSC 5 when all
25 available transmission capacity is in use. This is done by using the TCP/IP network 7.

C l a i m s

1. A method of switching a speech channel in a mobile telephone system comprising an interface between a Base Station System (BSS) (1) communicating with a Mobile
5 Switching Centre (MSC) (5) via a transmission connection (3), c h a r a c t e r i z e d i n that the speech channels of an originating subscriber (8) and a dialled-up subscriber (9), both of whom are located on the BSS (1) side of the transmission connection (3), are
10 connected in a local switcher (2).
2. A method in accordance with Claim 1, c h a r a c -
t e r i z e d i n that a signalling channel corresponding to a set of speech channels is monitored by
15 means of an analyzer (6), information regarding the dialled-up subscriber (9) being analyzed in order then to connect the calls in the local switcher if both subscribers (8, 9) are on the same side of the transmission connection (3).
3. A method in accordance with Claims 1 and 2,
20 c h a r a c t e r i z e d i n that a number of transmission links from the BSS (1) are concentrated down to a smaller number of transmission links transmitted via the transmission connection (3), whereupon the
25 smaller number of transmission links is expanded to the original number of transmission links before they are transmitted to the MSC (5).
4. A method in accordance with Claims 1 to 3, c h a r -
a c t e r i z e d i n that the analyzer (6) monitors the capacity utilization in the transmission connection (3) and prevents the MSC (5) from attempting to
30 set up further calls if the capacity is fully utilized.

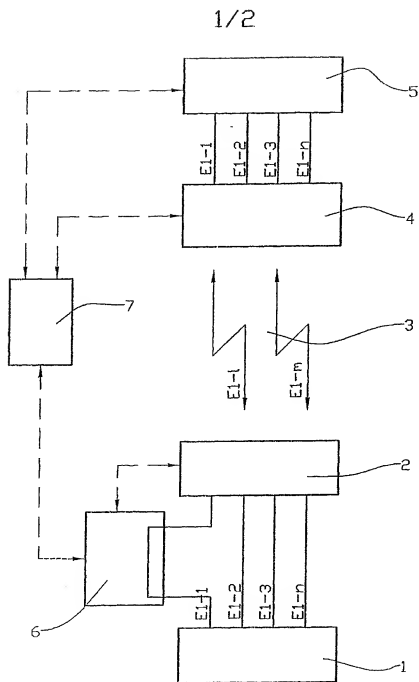


Fig. 1

2/2

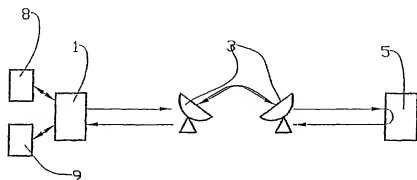


Fig. 2

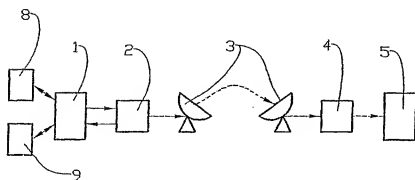


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 2004/000288

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04B 7/185, H04Q 7/22, H04Q 7/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04B, H04M, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6141531 A (WILLIAMS, B G ET AL), 31 October 2000 (31.10.2000), column 3, line 41 - line 56, claims 1-22, abstract ---	1-4
X	GB 2334179 A (MOTOROLA LTD), 11 August 1999 (11.08.1999), page 1, line 24 - page 4, line 24, claims 1-9, abstract	1
Y	---	2-4
Y	US 20030119512 A1 (NAKASHIMA, H), 26 June 2003 (26.06.2003), claims 1-10, abstract	2-4
A	---	1

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents

"A" document defining the general state of the art which is not considered to be of particular relevance

"B" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (to specify)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"Z" document member of the same patent family

Date of the actual completion of the international search

20 January 2005

Date of mailing of the international search report

2 1 - 01 - 2005

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer:

Roger Bou Faisal /LR
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 2004/000288

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 03046603 A1 (THISS PTY LTD), 5 June 2003 (05.06.2003), claims 1-18, abstract --	1-4
A	US 6138014 A (ALPEROVICH, V ET AL), 24 October 2000 (24.10.2000), claims 1-40, abstract --	1-4
A	US 6169892 B1 (SOLLEE, P), 2 January 2001 (02.01.2001), claims 1-12, abstract -- -----	4

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/ND 2004/000288

US	6141531	A	31/10/2000	AU	8476398	A	15/06/1999
				CN	1283340	T	07/02/2001
				EP	1032990	A	06/09/2000
				US	6374078	B	16/04/2002
				WO	9927666	A	03/06/1999
				US	5995849	A	30/11/1999
GB	2334179	A	11/08/1999	AU	8640098	A	01/03/1999
				GB	9802366	D	00/00/0000
US	20030119512	A1	26/06/2003	DE	10260351	A	31/07/2003
				JP	2003199136	A	11/07/2003
				NO	20026227	A	27/06/2003
				SE	522904	C	16/03/2004
				SE	0203812	A	27/06/2003
WO	03046603	A1	05/06/2003	AU	PR910301	D	00/00/0000
				CA	2468350	A	05/06/2003
				GB	0411713	D	00/00/0000
US	6138014	A	24/10/2000	AU	3310699	A	15/09/1999
				BR	9908322	A	07/11/2000
				CA	2322268	A	02/09/1999
				WO	9944310	A	02/09/1999
US	6169892	B1	02/01/2001	NONE			

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P24440PC	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No PCT/NO2004/000288	International filing date (day/month/year) 29-09-2004	Priority date (day/month/year) 29-09-2003
International Patent Classification (IPC) or national classification and IPC H04B7/185, H04Q7/22, H04Q7/30		
Applicant MARITIME COMMUNICATIONS PARTNER AS et al		

<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36</p> <p>2. This REPORT consists of a total of <u>5</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> (sent to the applicant and to the International Bureau) a total of <u>9</u> sheets, as follows:</p> <div style="margin-left: 40px;"> <input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions)</div> <div style="margin-left: 40px;"> <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box</div> <p style="margin-left: 20px;">b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>	
<p>4. This report contains indications relating to the following items:</p> <div style="margin-left: 20px;"> <input checked="" type="checkbox"/> Box No. I Basis of the report <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability, citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input checked="" type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application</div>	

Date of submission of the demand 26-07-2005	Date of completion of this report 19-09-2004
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Roger Bou Faisal/MN Telephone No. +46 8 782 25 00

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/NO2004/000288

Box No. I Basis of the report

1. With regard to the language, this report is based on:

- ☐ the international application in the language in which it was filed
☒ a translation of the international application into English
which is the language of a translation furnished for the purposes of:
☒ international search (Rules 12.3(a) and 23.1(b))
☐ publication of the international application (Rule 12.4(a))
☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):

- ☐ the international application as originally filed/furnished
☒ the description:
pages _____ as originally filed/furnished
pages* 1-7 received by this Authority on 15.12.2004
pages* _____ received by this Authority on _____
☒ the claims:
pages _____ as originally filed/furnished
pages* _____ as amended (together with any statement) under Article 19
pages* 1-2 received by this Authority on 26.07.2005
pages* _____ received by this Authority on _____
☒ the drawings:
pages 1-2 _____ as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____
☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/figs _____
☐ the sequence listing (specify): _____
☐ any table(s) related to the sequence listing (specify): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c))

- ☐ the description, pages _____
☐ the claims, Nos _____
☐ the drawings, sheets/figs _____
☐ the sequence listing (specify): _____
☐ any table(s) related to the sequence listing (specify): _____

* If item 4 applies, some or all of these sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/NO2004/000288

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-4</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-4</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-4</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The object of the invention is to reduce the audible time delay that occurs when the signals are transmitted via a satellite channel.

The problem is solved by locally switching calls between subscribers located on the same side of the base station system, and by analyzing and monitoring the capacity utilization in the transmission connection.

Documents cited in the International Search Report:

D1: US 6141531, A

D2: GB 2334179, A

D3: US 2003119512, A1

Document D1 is considered to represent the closest prior art. D1 provides a decentralized wireless communications system for voice and data communication that allows for a flexibility of communication paths, provides local communication as well as optional links to external networks, such as public switch telephone networks, satellites and radio emergency networks, does not require a centralized switching centre, provides for secure operation, allows for controlling the operational state of the internal network, provides for emergency notification and provides a way to collect revenue from the system (see abstract and claims)

D2 reveals a method involving the step of determining whether a station being called is located within the same cell, or an adjacent sub-cell, as the calling station. The cell or sub-cell is controlled by a common base station controller, and a

.../...

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

call is routed through the common base station controller, which controls the switching via the local PBX without reference to a mobile services switching centre.

Independent claim 1

The invention according to amended independent claim 1 describes a local switcher in a base station system (BSS) used for locally connecting two subscribers served by the same BSS. The invention according to amended claim 1 differs from D1 by rerouting the speech channel locally and not rerouting the signalling channel. This way the normal function of the MSC may be retained.

The cited documents fail to reveal this feature.

Both D1 and D2 describe systems for locally switching (Routing) calls from one subscriber to another where the dialled-up subscriber is located on the same BSS (cell, area). This well-known procedure is used in many mobile systems for reducing delays in the communication and for reducing the load on the mobile switching centre (MSC).

However, both in D1 and D2 the rerouting is done to the complete call by utilizing specialised purpose made equipment.

Accordingly, the invention defined in claims 1- 4 is novel and is considered to involve an inventive step. The invention is industrially applicable.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/NO2004/000288

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Dependent Claim 4 should only refer to dependent claim 2 since the analyzer is not mentioned in independent claim 1 or in dependent claim 3.

METHOD FOR REDUCING THE TIME DELAY IN A TELEPHONE SYSTEM

This invention regards a method for reducing the time delay in a telephone system. More particularly, it regards a method for reducing the audible time delay that occurs when the signals are transmitted e.g. via a satellite channel. In the following, reference is made, for illustrative purposes, to a satellite connection or channel. Satellite connection is here taken to mean an entire satellite system comprising multiplexers (MUX), antennas and satellite.

- 10 In the following, reference is made, for illustrative purposes, to a GSM system (GSM - Global System for Mobile Communication) which employs a so-called A-interface between a Base Station System (BSS) and a Mobile Service Switching Centre (MSC). In conventional mobile telephony all calls are
15 connected in the Mobile Service Switching Centre.

Under normal circumstances such a solution is acceptable, but when the BSS and the MSC communicates e.g. via a satellite connection, an audible time delay in the order of 0.5 seconds will arise.

Typically, this is a problem when the BSS is located on a ship and the MSC is on shore.

The time delay doubles when both parties are on the same side of the satellite connection, as the signals must then first
 5 be sent via the satellite connection to the MSC and then return to the BSS via the same satellite connection.

The object of the invention is to remedy the disadvantages of prior art.

The object is achieved in accordance with the invention, by
 10 the characteristics stated in the description below and in the following claims.

According to a standardized protocol for telephone systems of this type, signalling and speech are separated into two separate channels, a signalling channel and a speech channel.
 15 Thus it is possible to process data transmitted via the speech channel without interfering with the signalling channel.

When two persons on the same side of a satellite connection call each other, the speech channels can be connected by use
 20 of a local change-over switch or switcher, while the signalling channel is transmitted to the MSC via the satellite connection. Thus the speech channel is not transmitted via the satellite connection and therefore is not subject to said time delay.

25 Monitoring and analysis of the data stream in the signalling channel between the BSS and the MSC makes it possible to extract any data indicating that a call should be switched locally, whereupon the respective speech channels are connected locally.

A further advantageous feature of the invention is that the transmission capability requirement of the satellite connection is reduced.

An A-interface (interface) for communication between a BSS and a MSC comprises a number of TDM (time-division multiplex) connections. By concentrating the number of calls routed via the satellite connection to a smaller number of TDM links at the BSS in order then to expand these concentrated TDM links to the initial number at the MSC, it becomes possible to save transmission capability in the satellite connection. Thus, TDM time slots not transmitted to the MSC can be used for local calls.

In a conventional mobile telecommunication system the capacity is determined by the total number of TDM time slots and links between the BSS and the MSC.

In those cases where all TDM time slots in said concentrated transmission connection are being used, the conventional mobile telecommunication system will attempt to set up more calls if there are any free TDM time slots for local calls. The reason for this is that a conventional MSC will not be able to keep track of which calls are local and which are long distance calls, and in consequence, nor will it know the capacity situation in the transmission connection.

The invention comprises a method of preventing the MSC from attempting to set up further calls when the capacity of the transmission connection is fully utilised.

The following describes a non-limiting example of a preferred method illustrated in the accompanying drawings, in which:

Figure 1 shows the principal components of a telephone system according to the invention;

Figure 2 shows the transmission paths of the signalling and speech channels according to prior art; and

5 Figure 3 shows the transmission paths of the signalling and speech channels according to the invention, the transmission path of the signalling channel being illustrated by a broken line.

10 In the drawings, reference number 1 denotes a BSS of a type that is known *per se*. The BSS 1 communicates with a local change-over switch or switcher 2 via a plurality of channels E1-1 to E1-n, where n is a selected number.

The local switcher 2 communicates via a transmission system 3, here in the form of satellite communication, with a remote 15 switcher 4 via a plurality of channels E1-1 to E1-m, where 1 and m are selected numbers.

The remote switcher 4 communicates via a plurality of channels E1-1 to E1-n with an MSC 5 of a type that is known *per se*. The channels E1-1- to E1-n between the remote switcher 4 20 and the MSC 5 correspond to the channels E1-1 to E1-n between the BSS 1 and the local switcher 2.

A TDM time slot monitor, decoder and analyser 6, hereinafter denoted TDM analyzer or optionally analyzer, is connected to the channels between the BSS 1 and the local switcher 2. In 25 Figure 1 this is illustrated by channel E1-1 being connected to the TDM analyzer 6.

The TDM analyzer 6 communicates with the local switcher 2 and with the remote switcher 4 and the MSC 5 by means of a TCP/IP

(Transmission Control Protocol/Internet Protocol) connection/network 7.

The TDM analyzer 6 constructs a local database of so-called IMSI (International Mobile Subscriber Identity) and MD-ISDN (Mobile Station - Integrated Services Digital Network) number
 5 for each mobile telephone associated with the BSS 1.

The IMSI number is read from the signalling message 'location_updating_accept', while MS-ISDN is obtained from the MSC
 5 by making an inquiry using the IMSI number as a reference.

10 Then the TDM analyzer 6 establishes a temporary list of all subscribers attempting to set up calls, hereinafter denoted A-subscribers 8, in the MSC 5.

The following A-interface messages are monitored in order to obtain the required information, the nature of the information being indicated in brackets:
 15

4. Cm_service_request (A-IMSI)
5. Connection_confirmed (logical signalling link Id)
6. Setup (MS-ISDN for B-subscriber)
7. Assignment_request (information regarding which time slot
 20 is being used).

The messages are obtained from the protocols SCCP (Signalling Connection Control Part), DTAP (Direct Transfer Application Part), BSSMAP (Base Station System Management Application Part) in the A-interface.

A temporary listing is stored in the MSC 5, which includes all mobile users to whom a dial-up is attempted, at all times, and these users/subscribers are hereinafter denoted B-subscribers 9.

- 5 The following A-interface messages are monitored in order to obtain the required information, the nature of the information being indicated in brackets:

8. Paging_response (B-IMSI)

9. Connection_confirmed (logical signalling link Id)

- 10 10. Assignment_request (information regarding which time slot is being used).

11. Connect_acknowledge (used as time of concentration for external calls).

- 15 When the A-subscriber receives the A-interface message 'connect_ack' the TDM analyzer 6 will make an inquiry for the B-MS-ISDN number in the above mentioned subscriber database and then check whether the resulting B-IMSI number is on the list of B-subscribers to whom a dial-up is being attempted. If the number is there, the corresponding TDM time slots are cross-
- 20 connected in the local switcher 2.

If calls are not to be cross-connected locally, e.g. when the A- and B-subscribers 8, 9 are in different BSS's 1, collected TDM time link information is used to initiate the desired concentration of the TDM time links.

- 25 All connections of calls and concentrations of TDM time links are controlled by the TDM analyzer 6. TDM time slot informa-

tion for the call in question is used to initiate switching of TDM time slots between the TDM time links on the BSS 1 and MSC 5 side of the local switcher 2 or the remote switcher 4 respectively, and the TDM links transmitted via the satellite connection 3.

Figure 1 shows an example in which four TDM-links are concentrated down to two TDM-links. Obviously other constellations are possible.

The TDM analyzer 6 stores and maintains a list of all calls switched through the local switcher 2 and the remote switcher 4 at all times. When a call is terminated, i.e. the A-interface message 'released' is read from the signalling channel for an active call, the TDM analyzer 6 will notify the local switcher 2 and the remote switcher 4 to break the connections for the call in question.

The relaying of information between the TDM analyzer 6 and the local switcher 2 takes place via a normal TCP/IP network. Likewise, the remote switcher 4 receives information from the TDM analyzer 6 in order to extract the TDM links from the satellite connection 3 to the total number of TDM links in the system in the correct manner.

The TDM analyzer 6 is arranged so as to keep track of the status of the capacity of the satellite connection 3 and prevent further calls from being set up in the MSC 5 when all available transmission capacity is in use. This is done by using the TCP/IP network 7.

A m e n d e d C l a i m s

1. A method of switching a speech channel in a mobile telephone system utilizing a signalling channel⁶² and a speech channel, the mobile telephone system comprising an interface between a Base Station System (BSS) (1) communicating with a Mobile Switching Centre (MSC) (5) via a transmission connection (3),
c h a r a c t e r i z e d i n that the speech channels of an originating subscriber (8) and a dialled-up subscriber (9), both of whom are located on the BSS (1) side of the transmission connection (3), are connected in a local switcher (2), while the routing of the signalling channel via the Mobile Switching Centre (MSC) (5) is retained.
- 15 2. A method in accordance with Claim 1,
c h a r a c t e r i z e d i n that a signalling channel corresponding to a set of speech channels is monitored by means of an analyzer (6), information regarding the dialled-up subscriber (9) being analyzed
20 in order then to connect the calls in the local switcher if both subscribers (8, 9) are on the same side of the transmission connection (3).
3. A method in accordance with Claims 1 and 2,
c h a r a c t e r i z e d i n that a number of
25 transmission links from the BSS (1) are concentrated down to a smaller number of transmission links transmitted via the transmission connection (3), whereupon the smaller number of transmission links is expanded to the original number of transmission links
30 before they are transmitted to the MSC (5).

26-07-2005

4. A method in accordance with Claim 3,
c h a r a c t e r i z e d i n that the analyzer
(6) monitors the capacity utilization in the
transmission connection (3) and prevents the MSC (5)
5 from attempting to set up further calls if the capacity
is fully utilized.

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

This declaration is of the following type:

- ☒ original
- ☐ divisional
- ☐ continuation
- ☐ continuation-in-part

INVENTORSHIP IDENTIFICATION

My residence, post office address and citizenship are as stated below next to my name. I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

METHOD FOR REDUCING THE TIME DELAY IN A TELEPHONE SYSTEM

SPECIFICATION IDENTIFICATION

The specification of which:

- ☒ is filed herewith
- ☐ was filed on _____, under Serial No. _____; or
- ☐ Express Mail No. (as Serial No. not yet known) and was amended on _____ (if applicable); or
- ☒ was described and claimed in PCT International Application No. PCT/NO2004/000288, filed on September 29, 2004; or
- ☐ was filed on _____, under Attorney Docket No. _____.

ACKNOWLEDGMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information I know to be material to patentability in accordance with Title 37, Code of Federal Regulations, §1.56, and which is material to the examination of this application; namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent.

- ☒ In compliance with this duty there is attached an Information Disclosure Statement in accordance with 37 CFR §1.98.

PRIORITY CLAIM (35 U.S.C. §119)

I hereby claim foreign priority benefits under Title 35, United States Code, §119, of any provisional or foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below, and have also identified below any provisional or foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

- ☐ No such applications have been filed.
☒ Such applications have been filed as follows:

A. Prior foreign/PCT application(s) filed within 12 mos. (6 mos. for design) prior to this application, and any priority claims under 35 USC §119

<u>Country/PCT</u>	<u>Application Number</u>	<u>Date Filed</u>	<u>Priority Claimed</u>
Norway	200034333	September 29, 2003	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No

B. All foreign application(s), if any, filed more than 12 mos. (6 mos. for design) prior to this U.S. application

<u>Country/PCT</u>	<u>Application Number</u>	<u>Filing Date</u>
--------------------	---------------------------	--------------------

C. U.S. Provisional Application filed within 12 months prior to this application

<u>Serial Number</u>	<u>Filing Date</u>
----------------------	--------------------

PRIORITY CLAIM (35 USC §120)

I hereby claim the benefit under Title 35, United States Code, §120, of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information that is material to the examination of this application (namely, information where there is substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application.

- ☒ No such applications have been filed.
☐ Such applications have been filed, as follows:

<u>Serial Number</u>	<u>Filing Date</u>	<u>Patented</u>	<u>Pending</u>	<u>Abandoned</u>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

POWER OF ATTORNEY

- ☒ Practitioners associated with the Customer Number: 26290
- ☐ I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

B. Todd Patterson	Registration No. 37,906
Keith M. Tackett	Registration No. 32,008
Douglas H. Elliott	Registration No. 32,982
William B. Patterson	Registration No. 34,102
Randol W. Read	Registration No. 43,876

Send correspondence and direct telephone calls to:

William B. Patterson
 PATTERSON & SHERIDAN, L.L.P.
 3040 Post Oak Blvd., Suite 1500
 Houston, TX 77056
 Telephone: 713/623/4844

DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and, further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Sec. 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patents issued thereon.

Full name of **sole or first** inventor: Svein Haglund

Inventor's signature: _____ Date: _____

Residence: Fredensvei 4
 N-4836 Arendal
 NORWAY

Post Office Address: Same as above Country of Citizenship: Norway

Full name of **second** inventor: Trond Høgsaas

Inventor's signature: _____ Date: _____

Residence: Børge Trollesvei 9
 N-4823 Nedenes
 NORWAY

Post Office Address: Same as above Country of Citizenship: Norway

Full name of **third** inventor: Trygve Sten Gustavsen

Inventor's signature: _____ Date: _____

Residence: Skibberhei 9
N-4817 His
NORWAY

Post Office Address: Same as above Country of Citizenship: Norway

Full name of **fourth** inventor: Knut Einar Refstie

Inventor's signature: _____ Date: _____

Residence: Sørmsveien 18
N-4870 Fevik
NORWAY

Post Office Address: Same as above Country of Citizenship: Norway

Full name of **fifth** inventor: Kjetil Kjellstadli

Inventor's signature: _____ Date: _____

Residence: Skiberheitunet 4
N-4817 His
NORWAY

Post Office Address: Same as above Country of Citizenship: Norway

Full name of **sixth** inventor: Knut Fjellheim

Inventor's signature: _____ Date: _____

Residence: Åsveien 21
N-4817 His
NORWAY

Post Office Address: Same as above Country of Citizenship: Norway

Full name of **seventh** inventor: Sjur Thomas Lien

Inventor's signature: _____ Date: _____

Residence: Bråstad
N-4848 Arendal
NORWAY

Post Office Address: Same as above Country of Citizenship: Norway